

WHAT IS CLAIMED IS:

1. An image processing apparatus, comprising:  
a camera for inputting an image of a face of a person to be recognized;

recognition area detection means for generating a difference image between the input image and a predetermined pattern and for detecting a recognition area whose value is above a threshold from the input image;

input data generation means for converting the recognition area to predetermined input data; and

similarity calculation means for calculating a similarity by comparing the predetermined input data with predetermined dictionary data;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

2. The image processing apparatus according to claim 1,

wherein the camera is set at one of two pillars of a gate apparatus for admitting a person in order to input the image of the face of the person passing through the two pillars of the gate apparatus.

3. The image processing apparatus according to claim 2,

wherein the camera inputs the image of the face of one person from slanting lower position against a passing direction of the one person.

4. The image processing apparatus according to claim 3,

wherein the predetermined pattern is a background image of the ceiling in a room in which the gate apparatus is located.

5. The image processing apparatus according to claim 4,

further comprising a variation correction means for eliminating low frequency element affected by illumination from the input image as a variation correction image, the variation correction image being supplied to said recognition area detection means.

6. An image processing apparatus, comprising:  
a camera for inputting an image of a face of a person to be recognized;

face detection means for detecting a face area from the input image;

facial part detection means for detecting a plurality

of facial parts from the face area; and

gaze direction detection means for detecting a gaze direction of the person from the plurality of facial parts;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

7. The image processing apparatus according to claim 6,

wherein the posture of the person defines the vertical axis to which the horizontal axis is perpendicular.

8. The image processing apparatus according to claim 7,

wherein said facial part detection means detects two pupils from the face area as the plurality of facial parts, and

wherein said gaze direction detection means calculates a similarity between each pattern of the two pupils and a dictionary pattern of pupil of each gaze direction, and selects one gaze direction of the dictionary pattern of the largest similarity as the person's gaze direction.

9. An image processing apparatus, comprising:

a camera for inputting an image of a face of a person

to be recognized;

face detection means for detecting a face area from the input image;

facial part detection means for detecting a plurality of facial parts from the face area;

person identification means for identifying the person using a facial pattern consisting of the plurality of facial parts; and

target means for leading at least one of a gaze direction and a facial position of the person to a predetermined direction or position;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

10. The image processing apparatus according to claim 9,

wherein the angle of elevation is  $20^{\circ} \sim 60^{\circ}$  so that the camera inputs the image including both pupils and both nostrils of the face of the person.

11. The image processing apparatus according to claim 10,

wherein said target means includes one of a CRT display viewable by the person, a liquid crystal display of

narrow view angle, a mark to lead the person's gaze direction, a mirror, and another camera to input a frontal face image of the person.

12. An image processing apparatus, comprising:
  - a first camera for inputting a first image of a face of a person to be recognized;
  - a second camera for inputting a second image of the face of the person;
  - face detection means for detecting a face area from the first image;
  - frontal face decision means for deciding whether the second image is a frontal face of the person by referring to the face area;
  - open eyes detection means for detecting a state of open eyes from the face area; and
  - image output means for outputting the second image inputted while the second image is decided to be the frontal face and the state of open eyes is detected;
- wherein a direction from a view position of the second camera to a center position of the face of the person is a facial front direction, and
- wherein a view position of the first camera is located lower than a position of the face of the person, and a direction of the optical axis of the first camera represents an angle of elevation from a horizontal

direction.

13. The image processing apparatus according to claim 12,

wherein the angle of elevation of the first camera is  $20^{\circ} \sim 60^{\circ}$  so that the first camera inputs the image including both pupils and both nostrils of the face of the person, and

wherein the second camera includes a target object to lead the person's gaze direction.

14. The image processing apparatus according to claim 13,

wherein said open eyes detection means supplies an open eyes state detection signal to said image output means if said open eyes detection means detects two pupils from the face area.

15. The image processing apparatus according to claim 14,

wherein said frontal face detection means calculates a similarity between the face area and a dictionary pattern of a frontal face as the first image, and supplies a frontal face detection signal to said image output means if the similarity is above a threshold.

16. The image processing apparatus according to claim 15,

wherein said image output means outputs the second image whose input timing is equal to the first image from which the state detection signal and the frontal face detection signal are supplied.

17. A method for processing an image, comprising the steps of:

inputting an image of a face of a person to be recognized using a camera;

generating a difference image between the input image and a predetermined pattern

detecting a recognition area whose value is above a threshold from the input image;

converting the recognition area to a predetermined input data; and

calculating a similarity by comparing the predetermined input data with a predetermined dictionary data;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

18. A method for processing an image, comprising the

steps of:

inputting an image of a face of a person to be recognized using a camera;

detecting a face area from the input image;

detecting a plurality of facial parts from the face area;

detecting a gaze direction of the person from the plurality of facial parts;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

19. A method for processing an image, comprising the steps of:

inputting an image of a face of a person to be recognized using a camera;

detecting a face area from the input image;

detecting a plurality of facial parts from the face area;

identifying the person using a facial pattern consisting of the plurality of facial parts; and

leading at least one of a gaze direction and a facial position of the person to a predetermined direction or position;

wherein a view position of the camera is located lower



than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

20. A method for processing an image, comprising the steps of:

inputting a first image of a face of a person to be recognized using a first camera;

inputting a second image of the face of the person using a second camera;

detecting a face area from the first image;

deciding whether the second image is a frontal face of the person by referring to the face area;

detecting a state of open eyes from the face area; and

outputting the second image inputted while the second image is decided to be the frontal face and the state of open eyes is detected;

wherein a direction from a view position of the second camera to a center position of the face of the person is a facial front direction, and

wherein a view position of the first camera is located lower than a position of the face of the person, and a direction of the optical axis of the first camera represents an angle of elevation from a horizontal direction.

21. A computer readable memory containing computer readable instructions, comprising:

instruction means for causing a computer to input an image of a face of a person to be recognized using a camera;

instruction means for causing a computer to generate a difference image between the input image and a predetermined pattern

instruction means for causing a computer to detect a recognition area whose value is above a threshold from the input image;

instruction means for causing a computer to convert the recognition area to a predetermined input data; and

instruction means for causing a computer to calculate a similarity by comparing the predetermined input data with a predetermined dictionary data;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

22. A computer readable memory containing computer readable instructions, comprising:

instruction means for causing a computer to input an image of a face of a person to be recognized using a camera;

instruction means for causing a computer to detect a face area from the input image;

instruction means for causing a computer to detect a plurality of facial parts from the face area;

instruction means for causing a computer to detect a gaze direction of the person from the plurality of facial parts;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

23. A computer readable memory containing computer readable instructions, comprising:

instruction means for causing a computer to input an image of a face of a person to be recognized using a camera;

instruction means for causing a computer to detect a face area from the input image;

instruction means for causing a computer to detect a plurality of facial parts from the face area;

instruction means for causing a computer to identify the person using a facial pattern consisting of the plurality of facial parts; and

instruction means for causing a computer to lead at least one of a gaze direction and a facial position of the

person to a predetermined direction or position;

wherein a view position of the camera is located lower than a position of the face of the person, and a direction of the optical axis of the camera represents an angle of elevation from a horizontal direction.

24. A computer readable memory containing computer readable instructions, comprising:

instruction means for causing a computer to input a first image of a face of a person to be recognized using a first camera;

instruction means for causing a computer to input a second image of the face of the person using a second camera;

instruction means for causing a computer to detect a face area from the first image;

instruction means for causing a computer to decide whether the second image is a frontal face of the person by referring to the face area;

instruction means for causing a computer to detect a state of open eyes from the face area; and

instruction means for causing a computer to output the second image inputted while the second image is decided to be the frontal face and the state of open eyes is detected;

wherein a direction from a view position of the second camera to a center position of the face of the person is a

facial front direction, and

wherein a view position of the first camera is located lower than a position of the face of the person, and a direction of the optical axis of the first camera represents an angle of elevation from a horizontal direction.